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P.M. 87-47

SURFICIAL GEOLOGY AND TILL GEOCHEMISTRY OF THE UPSALQUITCH FORKS (21 O/10) MAP AREA (WITH EMPHASIS ON GOLD DISTRIBUTION IN TILLS)

by

A.G. PRONK

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Copies available by contacting:

Minerals and Energy Division
Dept. of Natural Resources
and Energy
P.O. Box 6000
Fredericton, N.B. E3B 5H1

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Author: A.G. Pronk

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SURFICIAL GEOLOGY AND TILL GEOCHEMISTRY OF THE UPSALQUITCH FORKS (21 O/10) MAP AREA (WITH EMPHASIS ON GOLD DISTRIBUTION IN TILLS)

Surficial mapping of the Upsalquitch Forks area (NTS 21 O/10) took place during 1986. The surficial geology map (Plate 87-47A) is self explanatory. These notes will focus on the geochemistry of the basal till, with emphasis on the gold distribution. Sample density seems to be adequate.

Basal till was mapped and subdivided by lithology of the pebble-size material. This information is essential to forest resource management and comparisons with the forest site classification project (DNRE, Timber Management Branch) have proven it to be sufficiently accurate at the present sample density (0.25 km^2).

SAMPLE PROCEDURES AND PROCESSING

Sample sites were plotted on a 2 km grid pattern on a 1:50 000 topographic map and transferred to 1:35 000 black and white aerial photographs. Accessibility was established from recent (1984, 1985) 1:12 500 colour aerial photographs. Simultaneously with basal till sampling (up to 250 m in any direction of the plotted site), mapping took place and striae, overburden thickness, and bedrock outcrops were recorded. At each site, B- and C-horizon till samples were taken and soil characteristics, landform, slope, and vegetation inventory recorded. Approximately 100 pebbles were sampled to determine till lithology.

The dry sieved -250 mesh fraction (clay plus silt, -0.063 mm) was used for geochemical analyses of the C-horizon till for Au, As, Ag, Co, Cu, Fe, Mn, Mo, Ni, Pb, Sb, and Zn as

this fraction has proven to be most cost-effective and to have the best overall reliability for shallow till samples from northern New Brunswick (Pronk 1987). The reasons for using this fraction for gold analysis have been discussed by Pronk (1986). B-horizon samples were analysed for gold to further investigate its behavior in the surficial environment and to fill in gaps where no C-horizon till could be obtained.

The samples were analysed for Cu, Pb, Zn, Ag, Ni, Co, Mn, and Fe by Atomic Absorption and for Sb and Mo by Colorimetry at the NBDNRE Soils and Minerals lab in Fredericton. Au and As were determined using Fire Assay plus Neutron Activation Analysis and Atomic Absorption, respectively by Chemex Labs Ltd. in Vancouver. Geochemistry results were plotted on 3 maps to ease further evaluation of the data. Au (C-horizon and B-horizon), and As were plotted on one map (Plate 87-47B); Cu, Pb, Zn, Ag, Sb, and Co, Ni, Mn, Fe, Mo were plotted on two additional maps (Plates 87-47C, D). The C-horizon gold content was hand contoured and outlines regional patterns and highly anomalous values. For 25 C-horizon samples, duplicates were analysed and reproducibility was excellent over the entire range (Table 1).

GOLD IN TILLS OF THE UPSALQUITCH FORKS AREA

Known gold showings in the Upsalquitch Forks area are Simpsons Field, McCormack Brook, Jon Pol, Dalhousie Road, Upsalquitch Forks, and Mulligan Gulch. Regional gold distribution patterns can be traced from the Tetagouche Lakes area (Pronk 1986) although minor contour discrepancies occur in the boundary area.

Uniformly low values occur in tills overlying Silurian felsic volcanic rocks in the northeastern part of the area. High gold values are present within the Rocky Brook-Millstream Fault zone. Some of these are related to known gold showings (Upsalquitch Forks and McCormack Brook showings), but most are

TABLE 1

REPRODUCIBILITY OF GOLD ANALYSES

IN THE -250 MESH FRACTION (-0.063 mm)

ORIGINAL	DUPLICATE	ORIGINAL	DUPLICATE
2	4	-1	1
15	14	112	129*
40	49*	-1	-1
-1	1	200	83*
13	15	-1	16
3	5	56	59*
67	74*	11	12
7	6	19	15
43	27*	-1	-1
678	542*	4	7
3	-1	7	7
353	340*	50	56*
17	18		

-1 means less than 1 ppb
* duplicate in different shipment than original

Analyses: Fire Assay plus Neutron Activation analyses by Chemex Ltd., Vancouver, B.C.

in areas where no showings were known. Other high values are present in the northwest half of the area, underlain by Ordovician and Silurian calcareous sediments that are intruded by felsic and mafic dykes and sills and cut by major northeast-southwest-trending faults (Potter 1964; Davies 1979). Most of these anomalous values occur in comminution tills (Elson 1961) that consist mainly of glacially reworked local bedrock (calcareous siltstones) with little "foreign" material. Anomalies in these tills can be partly the result of preglacial surficial enrichment that was reworked by glacial action. Surficial enrichment is known from the area surrounding the Simpsons Field gold showing and in the gossans capping the Caribou and Murray Brook massive sulphide deposits. The gossan at Murray Brook, which is up to 60 m thick, probably formed during the Tertiary Period under (semi-) arid conditions, although Fleming (1961) believed it to be pre-Pennsylvanian. The Murray Brook gossan is capped by till of probable Wisconsinan age. Most recently found gold showings were discovered by sampling gossaniferous weathering products in road cuts. The known gossan deposits and soils occur in areas that were topographically sheltered from the intense glacial erosion that took place under an easterly ice-flow regime. This intense erosion may not have taken place in the western part of the map area.

BASE-METAL ANOMALIES

Copper sulphide showings are known in Ordovician and Silurian rocks in the northern, northwestern, and eastern parts of the map area (McKenzie Gulch, Burntland Lake, and Ramsay Brook) whereas zinc-lead-silver-copper occurrences are found in the Cambro-Ordovician rocks south and east of the Upsalquitch Forks area. The largest of these, the Restigouche deposit, comprises approximately 2.6 million tonnes of sulphides grading 6.8% zinc, 5.5% lead, 0.34% copper, and 95 g/t silver.

These showings are registered as Cu, Pb, Zn, Ni, Sb, Mo, Ag anomalies in the tills. East of the Restigouche deposit, anomalous high values continue to the map boundary, possibly indicating the glacial dispersal of the mineralized Restigouche material, or perhaps another sulphide deposit.

Scattered Ni, Zn, Sb, and Ag anomalies are present, some of which coincide with anomalous gold values.

ANOMALY DISPLACEMENT FROM BEDROCK SOURCES

In order to evaluate the till geochemistry data, a thorough understanding of the glacial history of the area is essential. The lack of thick surficial exposures and stratigraphical information forces a reconstruction of the glacial history using mainly erosional features such as whalebacks, glacial grooves, nailhead striae, and drumlinoid forms. Additionally, till fabrics and striated boulders in till give information on ice-flow directions during deposition. Erosion and deposition can take place during the same ice-flow phase in different locations. All these ice-flow indications are plotted on the surficial geology map. Till lithology supplies further information on glacial transport direction and distance.

The major ice flow took place in an easterly direction (080-110°) and was mainly erosional in the study area as indicated by the abundance of striae. Clast fabrics indicating an eastward ice flow are known from the Nepisiguit River valley 1.5 km south of Bathurst, where till with a north-northeast fabric overlies till with an east fabric (Gauthier 1982). In the western part of the area the east-west striae are absent and the tills are predominantly comminution tills (Elson 1961) consisting mainly of smeared weathered bedrock with few distal clasts. The fact that eastward striae are absent indicates

that either a) erosion did not reach bedrock, b) eastward glacial striae are covered by younger deposits, or c) ice was frozen to its substratum in this part of the area. No clast fabrics indicating eastward ice flow were observed in the Upsalquitch Forks and Tetagouche Lakes areas.

Secondary northeastward ice flow (040-070°) took place throughout the area and is recorded by striae, clast fabrics, and striated boulders in till. Most deposition took place under influence of northeastward-flowing ice, but this does not mean that material was necessarily transported in that direction. Intensity and abundance of eastward ice movement indicators suggest that most of the transport took place in an easterly direction.

Finally, ice flowed northward off the Northern Miramichi Highlands onto the Chaleur Uplands and eastward into the Nepisiguit River valley (Gauthier 1982) leaving the highlands as a nunatak zone. This flow is registered by minor striae and one clast fabric in the Upsalquitch River valley and seems to have influenced deposition only locally. The Northern Miramichi Highlands thus would have been exposed earliest and periglacial weathering during that time may be responsible for the tors on the Sagamook-Carleton massif (Seaman 1985).

The net result of these flow patterns is a mainly eastward transport of the material over a distance of a few hundred to a few thousand metres, although some pebble-sized clasts were transported up to 45 km in an east-northeast direction.

In the western part of the area, where comminution tills dominate, transport is only local and the anomalous gold values may possibly reflect preglacial surficial enrichment. Several of the values are extremely high (up to 678 ppb), and may partly be due to surficial enrichment rather than reflect normal bedrock contrasts.*

Till geochemistry anomalies tend to be displaced further from their bedrock sources where basal till is thicker (Shilts 1976). This distribution is the result of glacial erosion and transport that produces layering in the basal glacier load and is generally preserved in the basal till deposits. The material is sheared up into the glacier sole during erosion and the transport distance will depend upon the height of the shear zone. When basal ice conditions for deposition are met, deposition will start from the base upward and thus have a layering reflecting the bedrock up-ice, with local clasts at the base and more distal material upward in the section (Rappol and Stoltenberg 1985).

*Weathering can obscure the original chemistry, mineralogy, and texture and confusion is possible between weathering products of ore and those of ordinary rocks (Rose et al. 1979).

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